is described.——Dufour has described a fungus which grows on sponges, disintegrating the skeleton, and rendering it worthless. He names it *Torula spongicola.*——Most collectors have had to do with the yellow filamentous growth named Ozonium, but hitherto scarcely assignable to any place in a botanical system. Roumeguère concludes, from his recent investigations, that it is a sort of sclerotium stage of various hymenomycetous fungi belonging to the genera Coprinus, Lenzites and Craterellus.

ENTOMOLOGY.[1]

ENTOMOLOGY AT MINNEAPOLIS.[2]—*Remarks on Arzama obliquata.*—Mr. Riley also gave his experience in rearing this insect during the past two years. He exhibited specimens in all states. The eggs are laid in curious, broadly conical or plano-convex masses enveloped in hair and a mucous cream-colored secretion, which, combined, look much like spun silk inside and the glazed exudation of *Orgyia leucostigma* outside. The larva, pale at first, and more or less transparent during the earlier stages, but dark after the later stages, bores into the stems of Sagittaria and Pontederia and is semi-aquatic, the last pair of spiracles being exceptionally large and dorsal. There are two annual broods, the second hibernating as larva in moss and decaying stumps near the water. The moth shows great variation in color, and the summer generation is, on the average, not much more than half so large as the spring or hibernated generation and generally much paler. He had interesting notes on this and other semi-aquatic species, and would shortly publish a more full account of them.

Dr. Kellicott said he had bred this moth at Buffalo, N. Y., where it was very abundant, and he had found it to be single brooded. It is associated with another species, an account of which he promised to give at a future session. Adjourned.

August 15, 2 P. M., the club reconvened. Professor S. A. Forbes presented a paper entitled, "Memoranda with regard to the contagious diseases of caterpillars and the possibility of using the virus of the same for economic purposes." The following is a full abstract:

The use of contagious germs as insecticides.—Pasteur made, in 1869, discoveries showing that a contagious disease of the silkworm, one of the two to which the rapid decay of the silk industry at that time was due, and known to the French under the name of *la flacherie*, and to the Germans as *schlaffsucht*, was caused by the presence of ferment germs in the intestines of the worms, and afterward in the blood. He stated that Pasteur proved, by means of careful experiment, that this disease could be easily induced in healthy worms by sprinkling their food with

[1] This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

[2] Continued from p. 1070.

the dust of the excreta of diseased individuals, or an infusion of that dust; by exposing healthy worms to mere association with those suffering from *la flacherie*, and by simply moistening the food of perfectly healthy examples with an infusion of mulberry leaves which had begun to ferment. In this fermenting fluid appeared immense numbers of bacteria—evidently chiefly Micrococcus and Bacterium, as those genera are now understood—and after infection of their food the silk-worms contained these same bacteria in swarms, at first in the alimentary canal, where they set up a ferment of its contents, and later without the intestinal wall, causing a rapid decay of the tissues, accompanied by a conspicuous blackening of the skin. This invasion of the blood was usually post mortem, but sometimes occurred before life was extinct.

Professor Forbes detailed that in July, 1882, he found that the chinch bug was subject to a bacterian parasite belonging to the genus Micrococcus, which was, as a rule, abundant in the bugs infesting a certain field of corn, but could be rarely demonstrated in any number in specimens from fields not far removed. He found by careful dissection and observation that this Micrococcus has its principal, perhaps exclusive, seat in the alimentary canal; that the chinch bugs were becoming continually less numerous in the field where they were most attacked by it; that the apparent mortality affected chiefly the older individuals, as shown by the much smaller ratio of adults when compared with the brood elsewhere at this period; that the numbers of the Micrococcus increased rapidly when the bugs were closely confined without food, the bodies of starved specimens being alive with them; and that the same Bacterium occurred in myriads upon the surface of cornstalks which had been punctured by the bugs, evidently multiplied freely in the fermenting process of the plant. He also found that it could be readily cultivated in both animal and vegetable infusions infected from the fluids of the bugs; that it retained its vitality in a dried condition for several months, and that it multiplied rapidly in the blood of caterpillars when introduced by puncture with a fine needle, causing a torpid and helpless condition. He had, further, lately observed among caterpillars of *Datana ministra* a fatal, and seemingly contagious, disease extremely similar to *schlaffsucht*, and characterized, like that, by the excessive development of a Micrococcus in the intestines and in the blood,—in both before death. He had cultivated this Micrococcus without difficulty in both animal and vegetable infusions, and had begun experiments to determine whether the disease could be conveyed to healthy caterpillars by the use of these infected infusions.

Mr. Riley referred briefly to the similar endeavors by Europeans to utilize these disease germs against injurious insects, and regarded Professor Forbes's experiments of great scientific importance, but doubted whether, for many reasons, the results would prove of practical value to the farmer.

Bombus pennsylvanicus in a deserted wren's nest.—Professor Osborn called attention to the fact that he had noticed this species inhabiting a deserted wren's nest situated under the roof of a porch and at least twelve feet from the ground, it being the first instance he was aware of where they nested away from the surface of the ground.

Professor Westcott thought Xylocopa might have been mistaken for Bombus. Mr. Riley saw no reason to doubt the facts mentioned by Professor Osborn or that Xylocopa with such different appearance and habits could be mistaken for the Bombus, which was well known to utilize mouse nests.

Dr. Kellicott had noticed the occurrence of the same or some allied species of Bombus inhabiting a mouse's nest in the brace of a barn. Miss Murtfeldt had seen them domesticated in a marten's nest.

Plusiodonta compressipalpis.—Dr. Hoy presented for inspection the larvæ, pupæ and imagines of *Plusiodonta compressipalpis*. He had watched this moth through its transformations, and had noted that during its early larval stages its prevailing color was a pea-green varied with uniformly-placed black spots, which increased in number with each successive molt. Only during the last stage of its larval life was the insect usually noticeable by other than professional eyes, since then its color was reddish-brown ornamented with cream white. *Menispermum canadense* was its food-plant. The cocoon was formed by first building two nearly parallel, elliptical walls and then uniting them at the top. Some larvæ which had been displaced after beginning to pupate, had apparently become exhausted, or their teeth loosened, anticipatory of their approaching new condition, and they were willing to accept bits of paper held to them on a pin, with which they finished the cocoons already begun. The species in Racine cannot be more than two-brooded. The larvæ are not distinguishable from those of Geometrid moths, as they are true loopers. Their transformations in some particulars were exceedingly prompt, occupying only 30 days from the time the eggs were laid.

Dr. Riley stated that he had known certain Lepidoptera and notably *Leucania unipuncta*, *Aletia xylina* and *Anisopteryx pometaria* to go through larval growth in less than a fortnight. He had also reared *Plusiodonta compressipalpis* from *Menispermum canadense*, but was much interested in Dr. Hoy's account of the formation of the cocoon, as it undoubtedly explained the method that prevailed in all species which simulated the surroundings by covering the outside of the cocoon with particles of the object of attachment.

Professor Herrick made inquiry as to what are sometimes known as frost flies. Dr. Kellicott called attention to a monograph by T. Rymer Jones and one by E. Ray Lankester, to

be found in the *Quar. Jour. of Mic. Sci.*, and stated that the species common at Buffalo was *Corethra plumicornis.* Professor Forbes had noticed the larvæ of Corethra abundant in the stomachs of fishes. Adjourned.

Aug. 17, 2 P. M., the club reconvened and the following subjects were presented:

Food-habits of Gortyna nitela.—Professor Osborn stated that he had observed the larvæ of *Gortyna nitela* boring in young twigs of ash and had noticed many dead twigs from this cause. Had failed to rear imagos from these on account of parasites. He had also observed the same species feeding externally upon the leaves of the common plantain.

Gall-mites.—Professor Forbes stated that Mr. Garman's work on gall-mites is in press; that Mr. G. has familiarized himself with the bibliography of the subject and has made a careful study of gall-mites with a view to description of the species from physical characters rather than from the standpoint of their effects.

Black-knot.—Mr. Saunders remarked that he had noticed this year an unusual amount of the black-knot.

Aug. 16, 10 A. M., the club reconvened, when the president, Dr. Kellicott communicated the following:

Notes on certain boring Lepidopterous larvæ.—1. *Arzama obliquata* G. & R. This larva has already been referred to at a previous session of the club by Dr. Riley; some additional remarks may not be out of place. Its food-plant at Buffalo is almost entirely *Typha latifolia.* I have found it rarely in Sparganium. The eggs I have not found, but the small larvæ have been seen as early as June 12th. They feed at first in the spadix; they afterwards bore into the stems, remaining until fall, when they leave the same and crawl into the earth or old wood until April or May, when they transform in slight cocoons; the moths appear late in May. Dr. Riley has called attention to the fact that the last pair of spiracles are large and placed dorsally; this arrangement enables them to swim in the water or crawl about in the mud without suffocation. I have had them swimming in a pail of water five or six hours without apparent injury. When removed from their galleries and put in the water, they sink to the bottom and remain some time, finally rising to the top and swimming about for a fresh food-plant. I feel sure it cannot be double brooded at Buffalo. I have found it throughout Central and Western New York, Central Michigan and Eastern Wisconsin.

2. The second species to which I refer also bores the *Typha.* I have called it in my MS. *Nonagria subcarnea* in allusion to the carneous hue of the mature larva and that of many of the moths, especially when recently from the pupa shell. The females expand from 42 to 46$^{mm.}$ the males 35 to 38$^{mm.}$ Reddish-gray, head, thorax and palpi usually darker or fawn. The discal spot on primaries is black and well marked in most examples; there

are two well defined black dots between the discal and the base. The subterminal line is indicated by dots on the veinules; there is a row of black marginal lunules. The secondaries show a discal dot and in some examples a faint mesial line. Beneath, the discal dots are distinct on all the wings. The male is darker with similar markings. The moth should be compared with *N. sparganii* of Europe and *N. oblonga* Grote.

The larva may be at once distinguished from that of *A. obliquata* by the color and by the last spiracles having the usual position. It is single brooded; the mature larvæ in July prepare pupa cells in the stems; they take care not to uncover themselves, for the epidermis is left unbroken over the place for exit; the pupa rests in the lower part of the deep cell, when it dis closes the moth which, with its long clypeal spine, breaks up the tissue left by the caterpillar and escapes.

3. A third species (Chilo?) bores the stems of Scirpus. The larval habits are quite similar to those of *A. obliquata.* It passes the winter in the dead stems; in spring it seeks the new plants, bores into them, descending below the water line. When it is time to pupate it enlarges its gallery upward above the water, bores a a hole through the side which it carefully closes with a membrane of silk; the pupa cell is then carefully lined with silk, and the pupa rests low down in the stem. The pupa is provided with sharp cusps on the free abdominal rings by means of which it works its way up and breaks up the bar to the moth's escape; the pupa skin remains in the cell.

Mr. Riley, in commenting on Dr. Kellicott's communication, said that he had been greatly interested in the facts presented, and especially as to the pupation of the Nonagria. As to the difference in the clypeal projection on the two pupæ exhibited, he thought it might be sexual, as in most cases where the clypeus was produced, sexual difference occurred, the greatest development being, so far as he had observed, not in the male, but in the female. He had recently called attention in the NATURALIST to the correlation between the produced clypeus and the horny exsertile ovipositor, and the fact that they indicated endophytous larval habit. The various methods of imaginal exit in stemboring Lepidoptera, and the structural modifications that resulted were most interesting to the philosophical entomologist. In some species, as in the Nonagria here mentioned, the clypeal point on the pupa seemed merely a consequence of the necessary point in the imago, the pupa remaining in its burrow, and the imago boring out. In others, as in *Prodoxus decipiens*, the clypeal point on the pupa permitted it to partly bore out of the stem and thus release the imago which had no homologous point, but an unarmed head. In some borers the larva prepared a little door which the imago easily pushed open, the pupa remaining inactive within its prison, while in others, closely related, the pupa did

the work by forcing itself partly out. There could be no question as to the digoneutic nature of *Arzama obliquata* at Washington, and none as to its variability, as illustrated by his specimens. He doubted the generic value of Sphida that had been proposed for this species by Grote, or whether the five described species represented more than two good ones.

Cantharis nuttalli injuring wheat.—Mr. Riley exhibited wheat which on the intelligent testimony of Mr. T. S. Roberts, of Minneapolis, had been injured by *Cantharis nuttalli.* The beetles were abundant in some of the wheat fields of Dakota, and ate into the grain while it was tender.

Adjourned to meet at the call of the president.

INSECTS AS FOOD FOR MAN.—In the NATURALIST for May, on p. 546, mention is made of the practice of insect-eating by the natives of Africa. In the interior of Australia the natives are very fond of a large Coleopterous larva found in the bark of certain species of Eucalyptus. They eat them generally raw, holding them by the head and biting the body off as we would a cherry. They also cook them in the hot ashes and eat them.

I have never eaten them raw, as my courage was not sufficient, but they are very nice when cooked in the ashes, tasting something like roasted chestnuts.

Similar larvæ of moths, etc., are eaten by the natives all over the continent. But I have never seen them eat earthworms or raw snails, as some writers have stated.—*Edw. B. Sanger, Rockville Center, Long Island, N. Y.*

OCCURRENCE OF JUNONIA CŒNIA AT NATICK, MASS.—On the 17th of August I had the good fortune to see a specimen of *Junonia cœnia* flying by the roadside in this town. Unfortunately I had no means at hand for capturing it, so didn't get it, but am sure of its identity, as I am familiar with the species from southern specimens which I have had for a number of years in my collection.

I will quote for you the following from a note lately received from Mr. S. H. Scudder concerning *cœnia*: "You will find in *Psyche*, Vol. II, p. 276–7, a list of New England localities for *cœnia*, as far as I knew them four years ago. Nearly all the captures or sights were of single individuals, and were along the coast or in the larger river valleys. The farthest north known to me is at the southern extremity of Maine, just north of Portsmouth, N. H."—*E. J. Smith, Natick, Mass.*

THE COLORADO POTATO-BEETLE.[1]—I noticed in 1882 in my garden in Perry county, Penna., that there was no second brood of the potato-beetle. Inquiry and examination in the neighborhood showed that the fact was generally true. I was curious to

[1]Abstract of a paper by Professor E. W. Claypole, read in Section F at the late meeting of the A. A. A. S.

know why the insect thus appeared to be single brooded in the county, and purposed to make farther investigations in 1883. But in 1883 the potato-beetle almost failed to appear at all. For the first time, in my experience, since its arrival in the Middle States I saw the potatoes growing free and strong. Here and there a solitary specimen might be caught and a few nests of eggs and larvæ were destroyed, but there was no occasion to use poison at all. My neighbors were equally free, and during a journey to New York I observed everywhere the same immunity. Letters also from my former residence in Ohio told me that the same condition prevailed there. I think, consequently, we may accept it as true, that the potato crop has this season grown with less mischief from its great foe than at any time since the first invasion.

I wish, however, to call attention to the fact that the cause of this great diminution in its numbers must be sought, not during the past winter but in the preceding summer; yet that summer, 1882, was marked by no abnormal climate or weather; it was neither very hot, cool, dry nor wet. On the other hand the summer of 1881 was intensely hot and dry, the thermometer at one time marking 100° for five successive days, yet all through that summer the beetles were excessively abundant and injurious, and several applications of poison were needed to keep them within due bounds. The first beetle crop of 1882 was also as abundant as usual, so that to the great heat and long drought of 1881 cannot be due the diminution here pointed out.

RARE MONSTROSITIES.—At the Entomological Reunion at the Royal Aquarium, London, on March 5 of this year, Mr. E. H. Jones exhibited a larva of *Melanippe montanata*, which constitutes an abnormity of extreme rarity, the larva having the well-developed antennæ and prolegs of the imago. The specimen is figured in the June number of the *Entomologist*, 1883, p. 121, but the notes given by Mr. Jones are unfortunately rather scant. It appears that the specimen came from a batch of eggs hatched August, 1822, and was fed indoors during the winter. The antennæ were found to be developed February 15th, and the legs "became perfect" two or three days after. Both antennæ and legs then gradually shrank and dried, and the larva was killed on the 20th February in order to preserve the specimen.

A five-winged specimen of *Zygæna minos* is figured and described by Mr. Rogenhofer in the Proceedings of the Vienna Zoologisch-Botanischer Verein, 1882, pp. 34–35. In this rare monstrosity the fifth wing is between the two normal wings of the left side. It is of the form of the hind wings, but smaller and shows the coloration of the front wing. The venation is, however, quite peculiar. Only a few similar deformities are on record.

THE NERVOUS SYSTEM OF INSECTS.—Professor Ed. Brandt gives the results of his studies of the nervous system of the larvæ of Dip-

tera of the families Leptidæ, Bibionidæ, Xylophagidæ, Therevidæ, Dolichopodidæ, Fungicolæ, Limnobiidæ and Tabanidæ. Thirteen ganglia, two cephalic, three thoracic and eight abdominal, is the normal number in all the families except the last, but Rhyphus (Fungicolæ) has the two last abdominal ganglia fused together. The Tabanidæ have only seven ganglia, one cephalic (no infra-œsophagean ganglion), one thoracic and five abdominal, the three first distant, the last two approximated. "Thus the nervous system of the larvæ of Tabanidæ constitutes an intermediate form between the nervous system of the larvæ of the Muscidæ and that of the larvæ of the Nemocera and some other families of dipterous insects."——The same naturalist writes upon the nervous system of *Stylops melittæ* and *Xenos vesparum* (Strepsiptera). In the head the ganglion supra-œsophageum only is present, the thorax has one large ganglion with five nuclei; and the abdomen a single oval ganglion connected with the thoracic ganglion by a long and thin cord. The thoracic ganglion is divided into two parts, the first corresponding to the ganglion infra-œsophageum and the first thoracic ganglion of other insects; while the posterior and larger part corresponds to the other thoracic ganglia and to some abdominal ganglia.

HYMENORUS RUFIPES AS A MYRMICOPHILOUS SPECIES.—What we stated on p. 748 of the last volume regarding the habits of the larva of the above-mentioned species has been corroborated this spring. We have reared the beetle from larvæ found by Messrs. Th. Pergande and E. A. Schwarz in large numbers in the nests of *Formica fusca* in the vicinity of Washington. This ant constructs its nest of loose soil, and there are very few straying sticks or other vegetable substances in those nests which are likely to serve as food for the Hymenorus larvæ, and the food-habits of the species remain, therefore, a mystery.

MIGRATION OF PLANT-LICE.—You will perhaps have seen in the *Comptes Rendus* that I discovered this year the full cycle of life of *Tetraneura rubra* migrating from the roots *Triticum repens* to the trunks of the elms (*Ulmus campestris*). Now I wait anxiously for the first leaves to see if the young issuing from the fecundated egg give me the *Pseudogyne fundatrix* forming the corresponding gall. I have but little doubt that it will be so, because the winged *pupifera*, obtained at the grass roots, shows entirely the same characters as the *emigrant* of the galls, and the very same day I found the insect at the grass roots I found it also under the elm bark. Kessler writes me that "*without knowing where they go*," he has ascertained this year that species of Aphis left the trees, on which he observed them, in June and came back on the same in October. The species observed are *Schizoneura corni*, *Aphis padi*, *A. evonymi*, *A. viburni*, *A. sambuci*, *A. mali*, *A. pyri*, and *Siphonophora platanoides*.—*J. Lichtenstein, Montpellier, France.*

RECENT PUBLICATIONS.—Jules Lichstenstein has republished in condensed form, under the title of "L'Evolution biologique des pucerons en général et du Phylloxera en particulier," the views on the life-history of the Aphididæ that he has of late years so often repeated in numerous journals. Aside from his peculiar nomenclature, which no one seems to follow, there is a partial bibliographical sketch of the principal works on the subject.——Dr. Raphael Blanchard has just issued from the press of La Société Zoologique de France, at Meulan, a well printed work of 116 pages, on "Les Coccides Utiles," in which he has brought together in systematic order what is known of the useful species of scale-insects.——Professor J. H. Comstock has published as a report of the "Department of Entomology of the Cornell University Experiment Station," that portion of his report to the Department of Agriculture for 1881, which was omitted a year ago for want of space. The contents are, unfortunately, not indicated on the title even of the author's edition. The work forms a most useful compendium of what is known af the Diaspinæ, with a list of other described N. A. Coccids. Indices to the species and to the plants are given, and we regret that a bibliography was not added. The author seems not to have been aware of what we have written on *Chionaspis pinifolii* (Fitch), or on the Dorthesias of Fitch being the egg-covering of *Enchenopa binotata* Say.——Mr. A. E. Brunn gives in the same pamphlet, and has issued in separate form, an interesting paper on the Tineidæ infesting apple trees at Ithaca, the species treated of being *Lithocolletis cratægella, Ornix prunivorella, Aspadisca splendoriferella, Tischeria malifoliella* and *Bucculatrix pomifoliella.*

ENTOMOLOGICAL NOTES.—The most noticeable entomological articles contained in the *Annals and Magazine of Natural History* during the first six months of this year are as follows: Notes on British Spiders, with descriptions of three new species and characters of a new genus, by the Rev. O. P. Cambridge; the generic name Amphissa is preoccupied by a gasteropod mollusk. The same author also describes four new European spiders.——Notes on Lepidoptera from Japan and the Corea, and also from Melbourne, by A. G. Butler. The Corean collection represents an instructive combination of Japanese, European and Chinese features. Four new Corean and nineteen Australian species are described.——Mr. Butler also describes three Myriopoda of the genus Zephronia from the East Indian region, three of Spirostreptus from Madagascar; three new genera and as many species of Blattariæ, two of them from Madagascar; two species of the homopterous genus Platypleura from Madagascar, and one of Aphæna from Sumatra.——F. P. Pascoe describes numerous Coleoptera, chiefly from the Indian and Australian regions and South America. He complains that "Drs. Horn and LeConte have given us excellent accounts of the United States

species, but they sternly refuse to look at any other forms than their own. Dr. Horn finds fault with some of us for not studying the American species, but collections from the United States rarely or never come into the market."——The same naturalist makes considerable additions to the Australian Curculionidæ, describes a new Mantis from Pará, and gives a classification of the Homoptera. Thirteen families of this sub-order are defined, exclusive of the Aphidæ, Coccidæ, etc. (Phytophthiria), which are considered to belong to a lower group, and also of the Thripidæ, which he regards as higher.——C. O. Waterhouse describes nine new Longicorns, three Buprestids and four Cetoniids from Madagascar, and some Buprestids and Heteromera from various localities.——J. Wood Mason describes two new Indian Papilios, and notes that the scentless group to which one of them belongs mimics the strong-scented and nauseous Philoxenus group.——Mr. H. W. Bates describes four geodephagous Coleoptera from Northwest Mexico; and W. L. Distant two Rhopalocera from the Malay peninsula.——M. Viallanes (*Comptes Rendus*, November 14, 1881) remarks that in *Musca vomitoria* a pupa of from two to four days standing is embryonic in structure, consisting only of "two layers of central cells, one forming a solid cord composed of the epithelial cells of the digestive tube, which have reverted to the embryonic state, the other peripheral, consisting of the embryonic cells originating from the muscular nuclei and the cells of the adipose body. When the tissues of the larva are destroyed the tissues of the adult form." The histoblasts are composed of two laminæ, the outer thin, the inner thick. The outer disappears, the inner increases to form the integuments of the adult.——M. J. Lichtenstein (*Comptes Rendus* Feb. 20, 1882) describes the apterous male of *Acanthococcus aceris*, and mentions two or three other Coccidæ, the males of which are apterous.——W. J. Holland states, on the authority of Dr. Jno. Hamilton, of Allegheny, Penna., that the male *Eupsalis minuta* uses his jaws in extricating the proboscis of the female from the bark of the tree in which she sometimes gets stuck in boring a hole for oviposition (Bull. Brooklyn Ent. Soc., VI, p. 48).——Franz Löw gives (Wien. Ent. Zeit., September, 1883) good reasons for believing that the Sciara which Professor J. H. Comstock described as the author of the ocellate gall on red maple (Rep. Dept. Agr. 1881–2, p. 202) is not the architect. The larva figured shows it to be a true Cecidomyia, as Osten Sacken concluded. Sciara is not known to make galls, yet it is much more easily reared from the ground than Cecidomyia, and those not careful are very apt to make the mistake that they are getting the true gall-maker. Our experience corresponds with Löw's, and he is undoubtedly correct.——In the last issue of *Psyche* (Vol. IV, Nos. 111–112) Dr. Geo. Dimmock concludes a most careful and interesting study of the scales of Coleoptera. It is a

treat to read after an author as painstaking and original as Mr. Dimmock.——In the same number of *Psyche* appears a posthumous paper by Mr. V. T. Chambers on the "Classification of the Tineidæ."——Mr. E. B. Reed has compiled a General Index of the Entomological Reports of the Province of Ontario, from 1870–1882. It consists of (I) List of Illustrations, (II) Classified list of Illustrations, and (III) General Index. These are prepared somewhat after the style of our "General Index to the nine reports on the Insects of Missouri," except that the original sources of the illustrations are not given, which are to be regretted, as they are, for the most part, not credited in the reports. An index to food-plants would also have increased its value. One of the most noticeable errors is in the index, where we find "*Caloptenus septemdecim*, v., 31." There is no such name on p. 31 of Vol. v, but on p. 30 there is a reference to *C.* [*icada*] *septemdecim*. On the whole, however, the compiler's work has been well done, and it will be found most useful to those who have occasion to use the reports.

ZOÖLOGY.

THE DEEP-SEA FAUNA.—What is to be understood by the deep-sea fauna, and by what physical conditions its occurrence is governed, are questions of which Professor T. Fuchs attempts a solution in a paper published in the "Transactions" of the Austrian Geological Survey, and translated in the *Annals and Magazine of Natural History* for January, 1883. After enumerating the most characteristic deep-sea types, mostly vitreous sponges, corals, Brachiopods, Crinoids, Echini, a peculiar starfish (Brisinga), and a peculiar group of Holothurians (Elasmopoda), and the ribbon-like fishes, he shows that the passage of the littoral into the deep-sea fauna is gradual; but that over all the earth, at a depth of from 90 to 100 fathoms the deep-sea forms begin to be found. He regards the line of fifty fathoms as the ideal boundary line between the littoral and the deep-sea fauna, and that this depth is pretty nearly the same in all seas. Below thirty fathoms no plant life exists except a few straggling nullipores which, in the Mediterranean, extends to a depth of 150 fathoms. In the tropics, Fuchs claims, there is a comparatively sterile region, extending from about thirty to ninety fathoms; but no such region exists, as is well known, in the temperate and polar seas.

Now, he asks, by what physical conditions is this boundary line of fifty fathoms determined, and what, consequently, is the true conditioning cause of the appearance of the deep-sea fauna? With Dana he claims that temperature plays but a very subordinate part in the distribution in depth of sea animals. Among the facts he brings forward to prove this is the absence of deep-sea forms in shoal water in the Arctic regions, where the temperature is the same as at the bottom of the sea in the tropics. "In the